

Learning to put time in its place: The development of spatial gestures for time

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Background

Cross-linguistically, **talk of time uses the language of space**:

*“I’m looking **forward** to ISGS6!”* [3, 6]

As early as five years old, children are able to **spatialize time using external representations** [e.g. 5, 8].

Adults also use space to gesture about time [e.g. 1,2,4,7], using **length and location** to represent temporal order and duration [7]. English adults point **leftward/backward** to refer to the past, **rightward/forward** for the future [2]. Little is known about the **development** of these temporal gestures, or of metaphorical gestures more generally.

We addressed two questions about temporal gestures:

(1) What is their developmental timecourse?

(2) How do they relate to the comprehension of temporal language (e.g. tonight) & spatial artifacts (e.g. timelines)?

Methods

Participants: Children (5;0 - 8;11 years) and adults (not analyzed here) completed two tasks, order counterbalanced.

Task 1, Timeline Placement: tests comprehension of events and temporal terms and the ability to map them to a spatial artifact. Three sets of four items were placed on a timeline using crayons [cf. 5, 8]

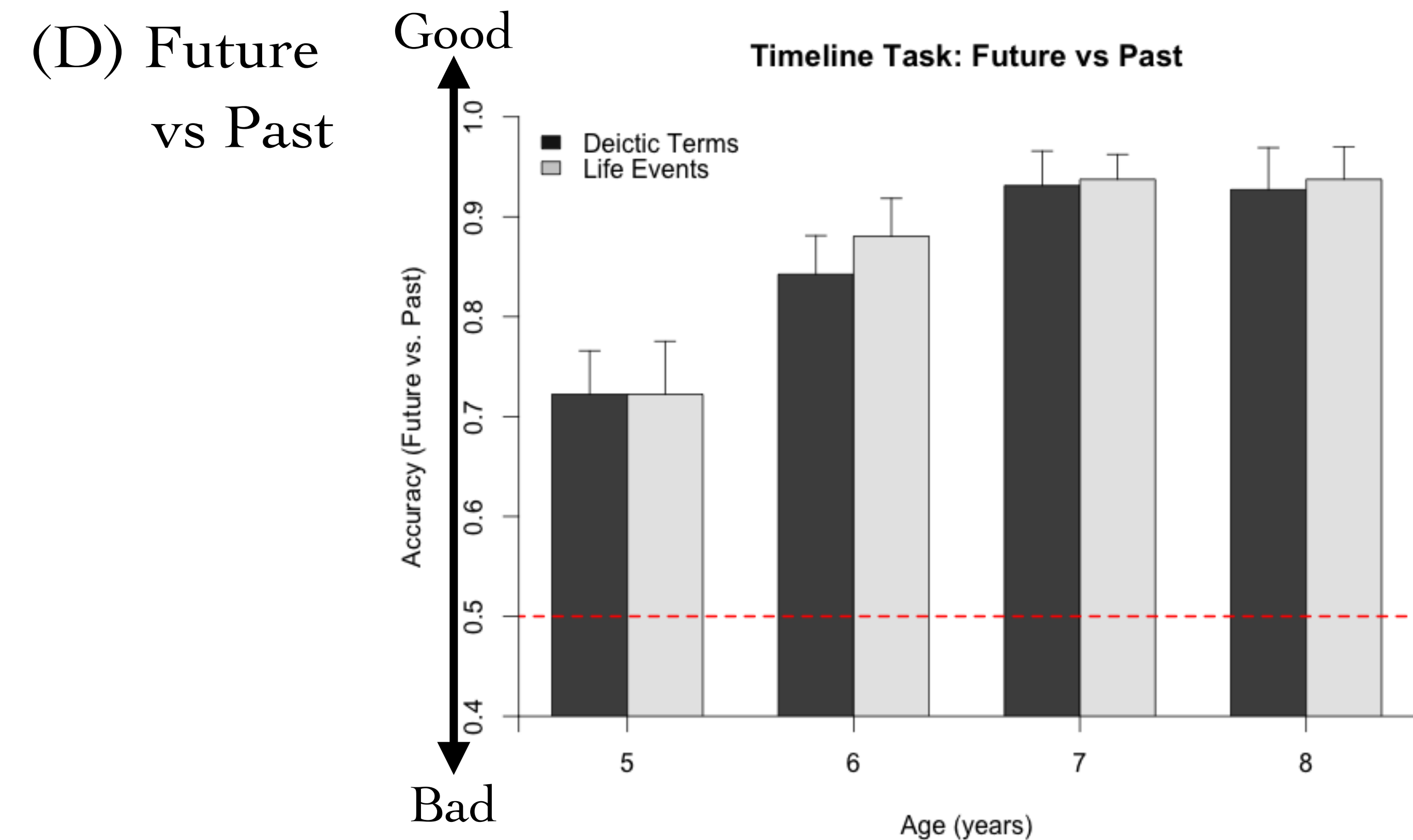
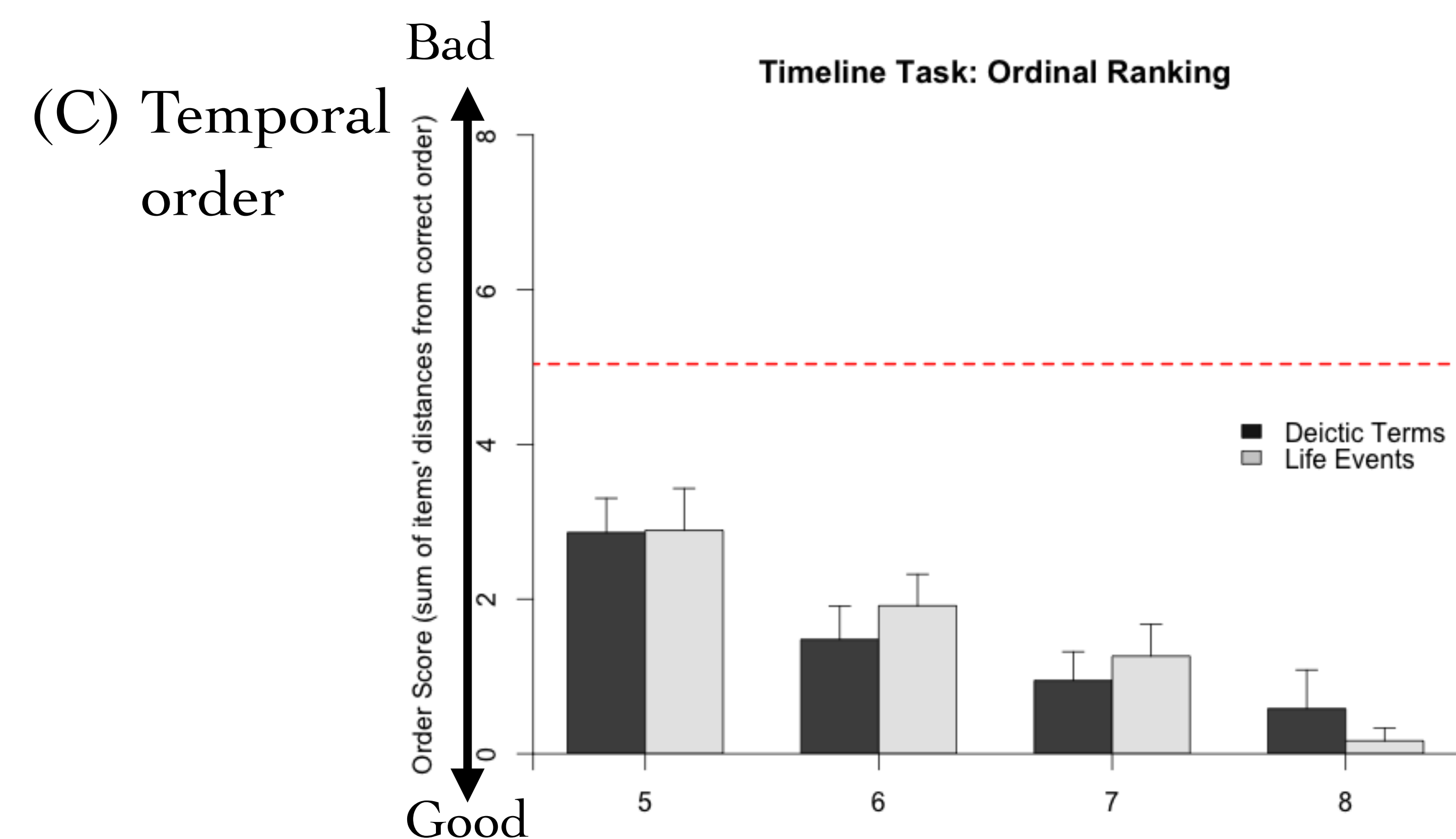
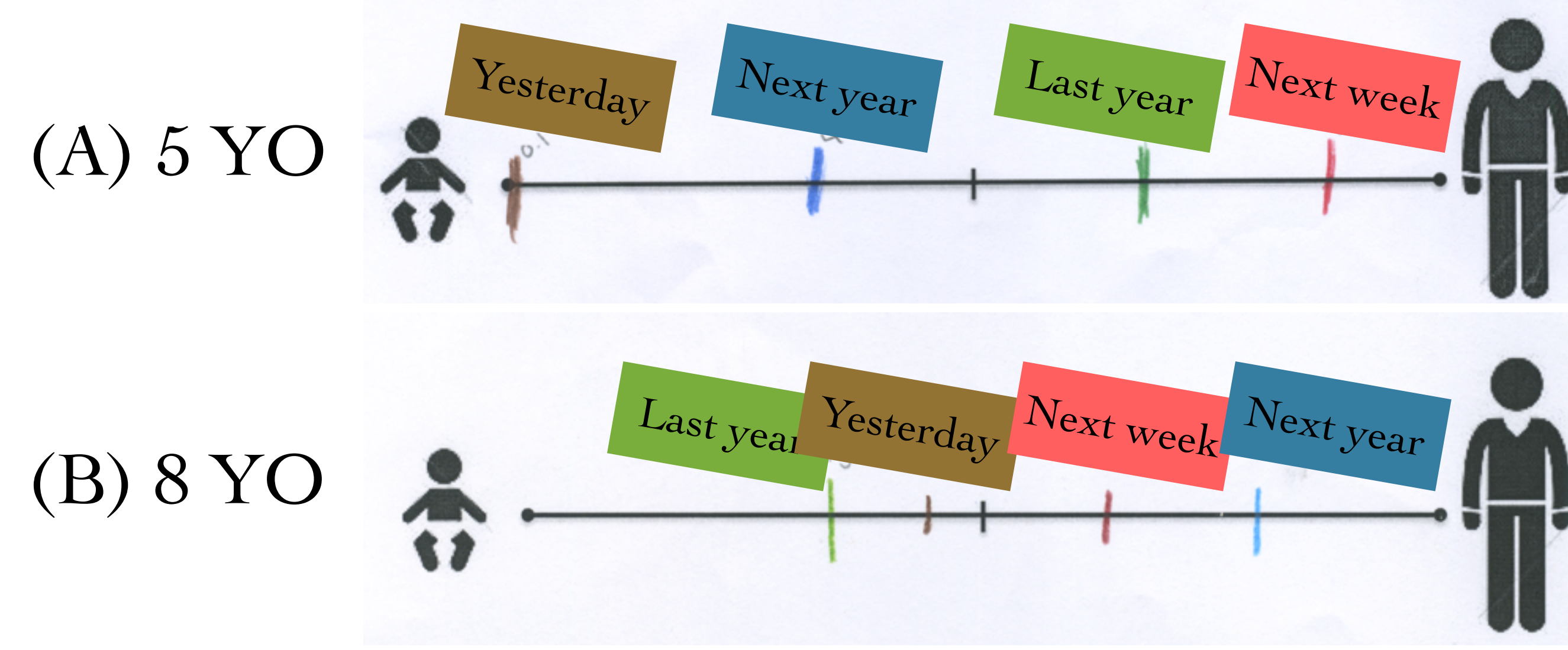
Line 1: Event	Line 2: Deictic	Line 3: Deictic
[age-1] birthday	this morning	last year
dinner today	tonight	yesterday
[age+1] birthday	tomorrow	next year
breakfast today	last week	next week

Task 2, Contrastive Definitions: designed to elicit spontaneous temporal gestures. Participants were asked to define contrastive terms.

“Can you teach me the difference between **tomorrow** and **yesterday**?”

- | | |
|-------------------------------|----------------------------|
| (1) tomorrow vs yesterday | (2) tonight vs last year |
| (3) last week vs next week | (4) tomorrow vs next week |
| (5) this morning vs yesterday | (6) last week vs next year |

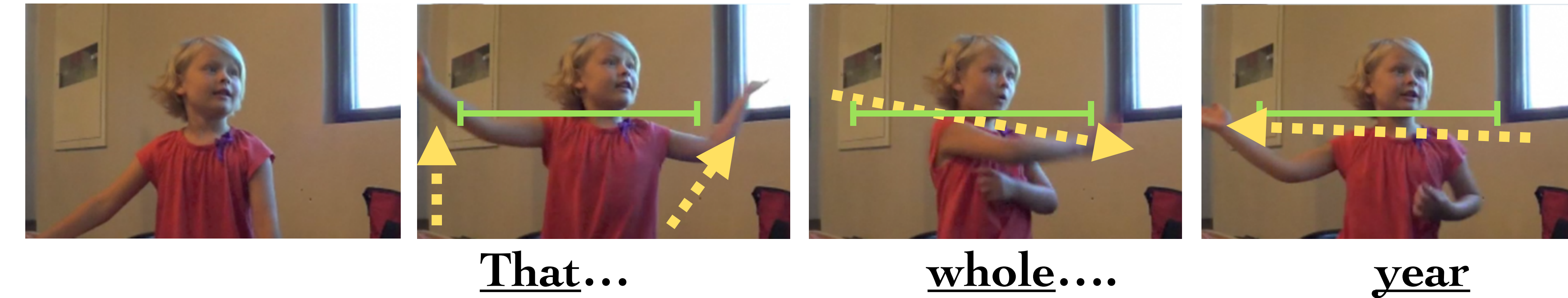
Results: Timeline



(A) Example response by a 5-yo child. Note the errors in both order and past/future placement. (B) Example timeline from an 8-yo child. Items are correctly ordered and placed in the past/future. (C, D) The red dashed lines indicate chance. The ability to place items in temporal order and identify them as past/future was above chance for all age groups and improved with age ($F_s > 18$, $p_s < .001$).

Results: Gesture

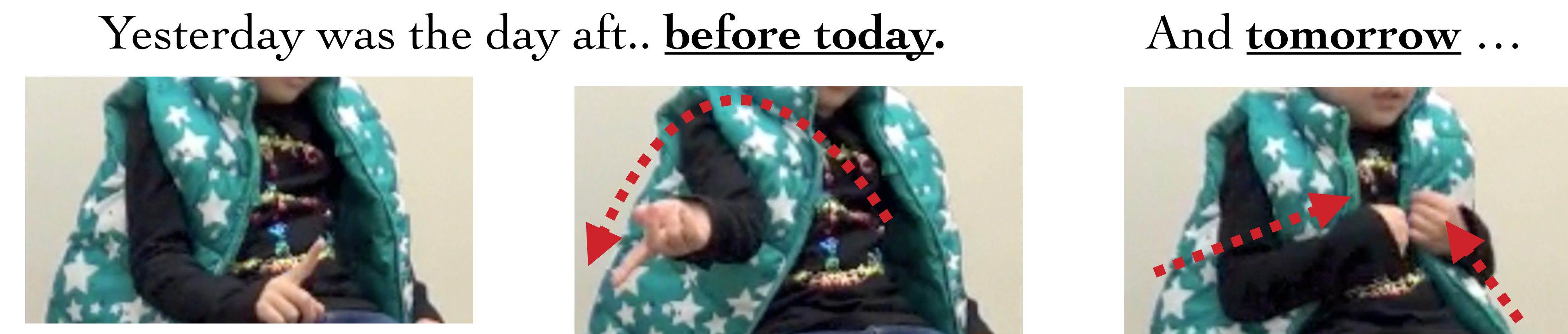
Duration: spatial length represents duration [2], as early as 5 years old



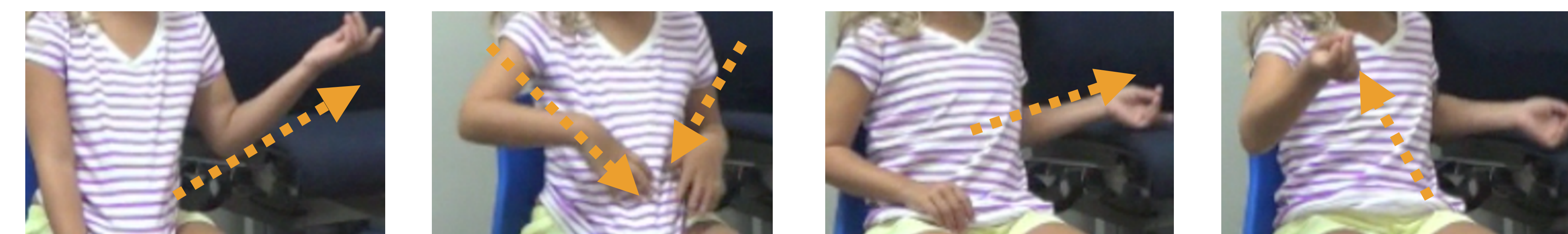
Pointing left for the past, right for the future, as early as 5 years old



Deictic center: ‘now’ is co-located with the body, as early as 5 years old



Gesture before language? Systematic, normative gesturing despite incorrect use of temporal language



Conclusions

- As young as 5yo, children use spatial properties of gesture (length, location) to represent temporal duration & relations
- By 5yo, children can use a timeline to indicate relative order and past/future of temporal terms and events, and this continues to improve throughout early school years (cf. 5, 8)
- Ongoing research is looking at interrelations between temporal gesture, the ability to use spatial artifacts, and comprehension of temporal language

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Questions, comments, queries?

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